Photo: Barbara Jansen

Basins of National Importance in the Midwest Region

This chapter describes the two largest watershed basins located in the Midwest Region.

Introduction to the Basins

The Midwest Region encompasses portions of seven different two-digit hydrologic units (large river basins): Upper Mississippi River Basin, Great Lakes Basin, Ohio River Basin, Missouri River Basin, Souris-Red-Rainy Rivers Basin, Arkansas-White-Red Rivers Basin, and Lower Mississippi River Basin.

The Upper Mississippi River Basin is by far the largest in area. Over 120 million acres, or 41 percent of the region, is included in the Upper Mississippi River Basin. The watershed area contains major portions of Illinois, Iowa, Minnesota, Missouri, Wisconsin, and small portions of Indiana and Michigan.

The second largest in the region is the Great Lakes Basin. The basin is the largest fresh surface water system in the world. The watershed area includes portions of Indiana, Illinois, Michigan, Minnesota, Ohio, and Wisconsin in the region.

The Upper Mississippi River Basin and the Great Lakes Basin provide economic opportunities, transportation, and recreation for the Midwest Region.

Upper Mississippi River Basin

This section describes the structure of agricultural production and natural resource issues in the Upper Mississippi River Basin.

The Mississippi River is more than just a river; it is a unique resource and the best example of a multi-purpose river in the United States. In 1986, Congress designated the Upper Mississippi River System as both a nationally significant ecosystem and a nationally significant navigation system. It is the only inland river in the Uniteds States to have such a designation. Congress further recognized the system as producing a diversity of opportunities and experiences, and directed that it be administered and regulated in recognition of its many purposes.

The river's natural resources continue to support one of the most diverse and biologically productive wildlife populations in the world. The river hosts more than 400 different species, including the nation's most ancient lineage of fish, and provides temporary refuge for 40 percent of North America's migratory waterfowl.

The river's floodplain includes dense forests of maples, cottonwoods, and willow; which support bald eagles, herons, egrets, and double–crested cormorants. Recreation on and along the Upper Mississippi River attracts 12 million visitors annually, which is four times more than Yellowstone National Park. Commercial fishermen continue to harvest carp, buffalo, catfish, and freshwater drum.

Agricultural production is a major component to the economic livelihood of residents of the Upper Mississippi River Basin. In 1997, there were over 59 million acres (49 percent) of cultivated cropland in the basin, of which 72 percent was corn and soybeans. The basin also includes over 8.8 million animal units, which represents over 41 percent of the regional total and 10 percent of the national total.

In 1997, there were over 252,000 farms in the basin, which represented over 44 percent of the regional total. The number of farms in the basin continues to decline, with an estimated 14 percent reduction from 1987 to 1997. (see figures 38 and 39)

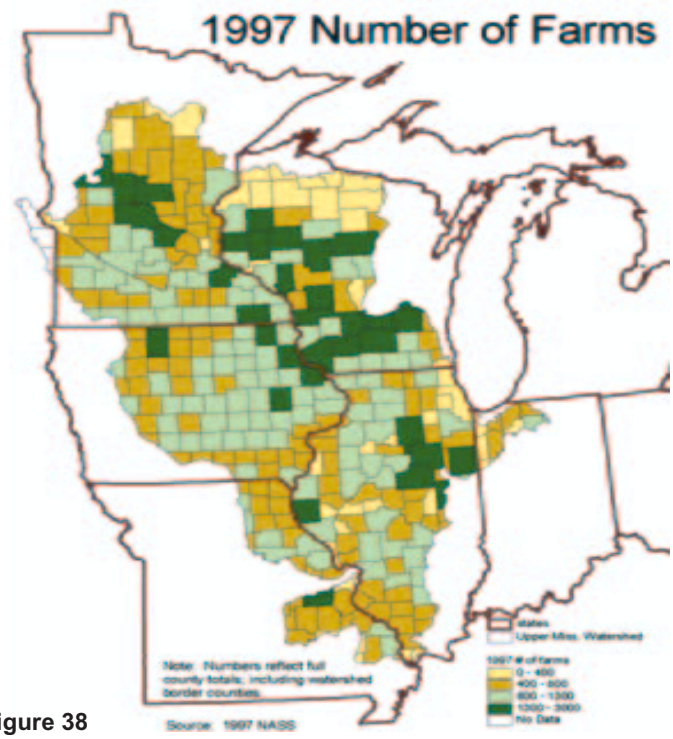

Figure 38

Upper Mississippi River Basin - 1997 Landuse/Cover

Landuse/cover	Upper Mississippi Basin	Percent
Cropland-cultivated	59,399,900	49.3%
Cropland-noncultivated	4,074,300	3.4%
Pastureland	10,870,600	9.0%
Forest land	24,470,000	20.3%
Minor land cover/uses	4,260,300	3.5%
Urban/Rural Transp	8,164,900	6.8%
Water	3,608,500	3.0%
Federal Land	2,333,800	1.9%
CRP	3,312,500	2.7%
Total	120,494,800	100.0%

Figure 39

Natural Resource Issues and Concerns

A river basin as large and as diverse as the Upper Mississippi River Basin will have numerous natural resource concerns and challenges. This assessment will focus on three issues, all of which are impacted by agricultural production on private lands:

- Soil Erosion
- Animal Waste/Nutrient Management
- Wetlands

Soil Erosion

In 1997, over 22 percent of the 59 million acres of cultivated cropland within the Upper Mississippi River Basin were eroding at annual rates exceeding tolerable limits (T). About 10 percent of these acres are actually eroding at a rate twice the tolerable limits. The Workload Analysis (WLA 2001) indicated that over 39 million acres of cropland within the Upper Mississippi River Basin needed some type of conservation system application. Not only does this erosion lead to inefficiencies and lost income for farmers, but also has serious environmental impacts. Sediment and attached chemical particles are a serious threat to the quality of surface water within the basin.

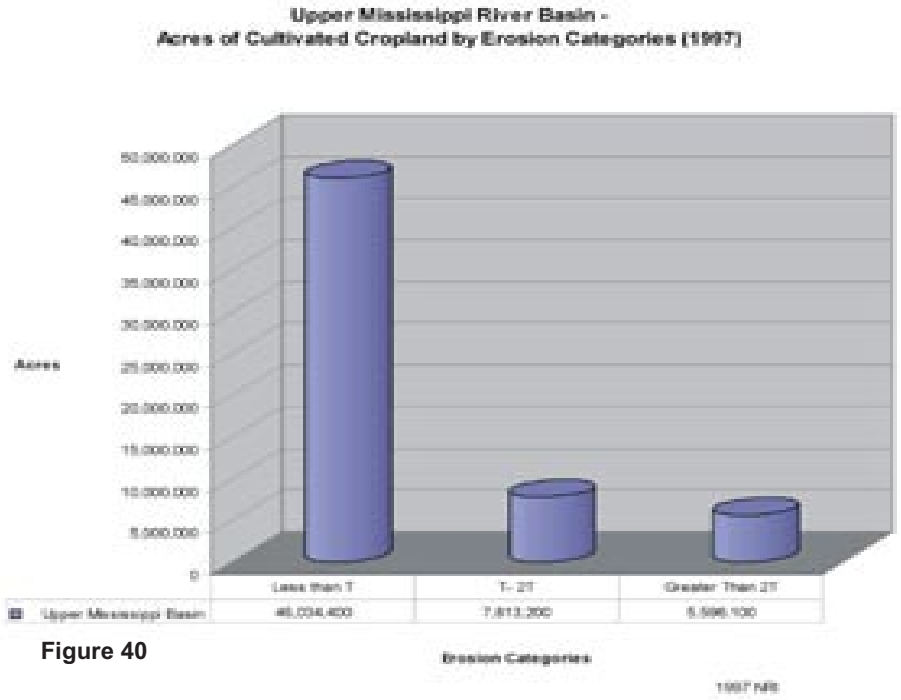

Figure 40

Erosion rates have declined significantly in the basin, since the early 1980s. Erosion, caused from water, has declined 37 percent from 1982 to 1997 and just over 11 percent from 1992 to 1997. Most erosion reduction is a direct result of farmers adopting conservation tillage practices and enrollment of highly sensitive lands in the CRP. (see figures 40 and 41)

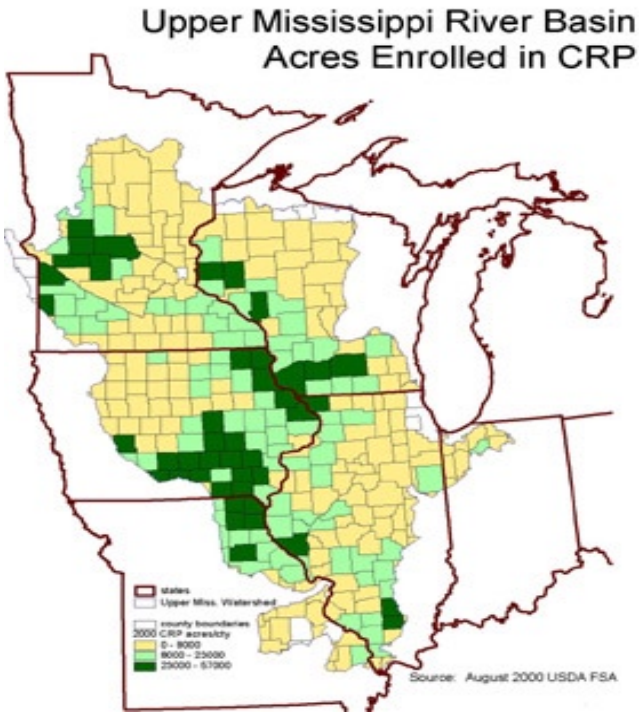

Figure 41

Currently, in the Upper Mississippi River Basin, there are more than 3.3 million acres enrolled in CRP, which represents 46 percent of the region and 10 percent of the nation's CRP acreage. In 1998, the basin had over 22 million acres of cropland with a conservation tillage system, which represents more than 21 percent of the nation's acres of conservation tillage.

Animal Waste/Nutrient Management

The current level of nitrates is a real concern in the Upper Mississippi River Basin. The average annual nitrate concentration in the Mississippi River has doubled since 1950. This has contributed to hypoxic conditions in the Gulf of Mexico. Agricultural livestock producers have recognized their potential for contributing to this problem and have begun addressing animal waste issues, through the development of comprehensive nutrient management plans. It is estimated that approximately one-fourth of the animal waste systems needing some-type of planning assistance nationally is located in the basin. These waste systems will ensure adequate storage and utilization of manure from the more than 6.5 million confined livestock within the basin. (see figure 42)

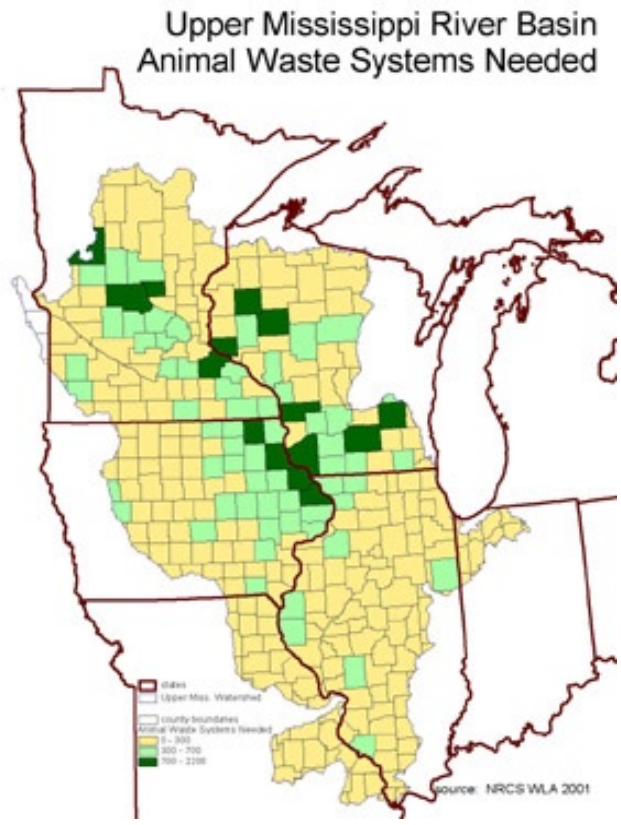

Figure 42

Wetlands

Wetlands are an important resource for the Upper Mississippi River Basin. Private landowners working with NRCS and other federal, state, and local agencies have placed a high priority in protecting, enhancing, and restoring wetlands in the basin. Wetlands are an important bridge between land and water with indistinct boundaries. Wetlands and their adjacent uplands provide public benefits that include:

- Improved water quality
- Enhanced habitat for wildlife
- Reduced soil erosion
- Reduced flooding

The Wetlands Reserve Program (WRP) has been very successful in the Upper Mississippi River Basin in protecting and restoring biologically rich wetlands. Over 122,000 acres of wetlands have been restored through the acquisition of nearly 1,200 easements. About one-half of the Region's WRP restored wetlands are located in the basin.

Private landowners are working with NRCS to protect and restore wetlands in the Upper Mississippi River Basin by enrolling over 122,000 acres in the Wetlands Reserve Program (WRP).

Partnership

While blessed with abundant and productive natural resources, the Basin is also fortunate to have a multitude of stakeholders interested in enhancing the quality of those natural resources. These include federal, state, tribal, nonprofits, and other organizations and groups who work diligently to further their separate missions as well as many jointly held goals regarding the quality of the Basin's natural resources and its people. A major legislative initiative, the Upper Mississippi River Basin Conservation Act of 2000, was introduced in the 106th Congress. This Act was aimed at understanding natural resource issues related to sediment and nutrient movement into the Basin's waterways. This has further stimulated partnership development toward helping shape policy for natural resources management in the Basin. This Act grew from a major Land Stewardship Initiative developed by St. Mary's University, in conjunction with several federal and state agencies and nonprofit groups. This Initiative continues to leverage additional discussion and support for improving natural resources management.

Summary of the Upper Mississippi River Basin

In a Nation endowed with magnificent water resources, the Upper Mississippi River is unparalleled. The 1,300-mile waterway directly links five states to the Gulf Coast export markets. The river system supports a tremendous range of uses. The Upper Mississippi River Basin consists of over 120 million acres, of which 98 percent is privately owned. It drains more than 41 percent of land in the Midwest Region. Agricultural production is a major component of the economic livelihood of residents of the basin. The Basin is also fortunate to have a multitude of stakeholders interested in enhancing the quality of those natural resources.

Upper Mississippi River Basin Facts

- Over 41 percent of the Midwest Region is included in the Upper Mississippi River Basin.
- In 1986, Congress designated the Upper Mississippi River System as both a nationally significant ecosystem and a nationally significant navigation system.
- In 1997, there were 59 million acres of cultivated cropland in the Upper Mississippi River Basin, or 49 percent of the basin landuse.
- In 1997, 44 percent of the Region's farms were located in the Upper Mississippi River Basin.
- Erosion in the basin, caused from water, has declined about 37 percent from 1982 to 1997.
- In 1997, 13.4 million acres (22 percent) of cultivated cropland, within the Upper Mississippi River Basin, was eroding at annual rates exceeding tolerable limits (T).
- Over 46 percent of the Region's and 10 percent of the nation's acres enrolled in CRP are in the Upper Mississippi River Basin.
- The average annual nitrate concentration in the Mississippi River has doubled since 1950.
- Approximately one-fourth (69,520) of the animal waste system needing some type of planning assistance nationally is located in the Upper Mississippi River Basin.
- Over 122,000 acres of wetlands have been restored through the acquisition of nearly 1,200 WRP easements within the Upper Mississippi River Basin.

Great Lakes Basin

This section describes the resource issues in the Great Lakes Basin.

The Great Lakes--Superior, Michigan, Huron, Erie, and Ontario--and their connecting channels form the largest fresh surface water system on earth. Covering more than 94,000 square miles and draining more than twice as much land, these freshwater seas hold an estimated 6 quadrillion gallons of water, about one-fifth of the world's fresh surface water supply and nine-tenths of the U.S. supply. If spread evenly across the contiguous 48 states, the lakes' water would be about 9.5 feet deep.

In spite of their large size, the Great Lakes are sensitive to a wide range of pollutants. The sources of pollution include losses of sediment, nutrients, and farm chemicals from agricultural lands, waste from cities, discharges from industrial areas, and leachate from disposal sites. The large surface area of the lakes also makes them vulnerable to direct atmospheric pollutants that fall with rain, snow, or dust on the lake surface.

Outflows from the Great Lakes are relatively small (less than 1 percent per year) in comparison with the total volume of water. Pollutants that enter the lakes; whether by direct discharge along the shores, through tributaries, from land use, or from the atmosphere, are retained in the system and become more concentrated with time. Also, pollutants remain in the system because of resuspension (or mixing back into the water) of sediment and cycling through biological food chains.

Because the watershed encompasses a large part of North America, physical characteristics such as climate, soils, and topography vary across the basin due to glaciation. To the north, the climate is cold and the terrain is dominated by a granite bedrock called the Canadian (or Laurentian) Shield, consisting of Precambrian rocks under a generally thin layer of acidic soils. Conifers dominate the northern forests.

In the southern areas of the basin, the climate is much warmer. The soils are deeper with layers or mixtures of clays, silts, sands, gravels, and boulders deposited as glacial drift or as glacial lake and river sediments. The lands are usually fertile and have been readily drained for agriculture. The original deciduous forests have given way to agriculture and sprawling urban development.

Photo: NOAA

The Great Lakes are the largest system of fresh surface water on the earth; however, they are sensitive to the effects of a wide range of pollutants.

Environmental History

While parts of the Great Lakes ecosystem have been changed to better suit the needs of humans, the unexpected consequences of many of the changes have only recently become apparent. Since about 1960, there has been an awakening to the magnitude of these changes and the harsher implications of some human activities.

The largest categories of impact are pollution, habitat loss, and exotic species. At first, the impact was localized. Agricultural development, forestry, and urbanization caused streams and shoreline marshes to become filled with silt and harbor areas to become septic. Domestic and industrial waste discharges, oil and chemical spills, and the effects of mining left some parts of the waterways unfit for water supply and recreation.

Waste-treatment solutions were adopted to treat biological pollutants that threatened the immediate health of populations. In some jurisdictions, regulations were passed to prevent unregulated dumping in the waterways. Even today, health problems from E. coli bacteria and cryptosporidium in drinking water threatens the viability of the region. Except in shallow bays and shoreline marshes, the Great Lakes were oligotrophic before European settlement and industrialization. Their size, depth, and the climate kept them continuously cool and clear. The lakes received small amounts of fertilizers such as phosphorus and nitrogen from decomposing organic material in runoff from forested lands. Small amounts of nitrogen and phosphorus also came from the atmosphere. These conditions have changed.

Temperatures of many tributaries have been increased by removal of vegetative shade cover, climate change, and some by thermal pollution. More importantly, the amounts of nutrients and organic material entering the lakes have increased with intensified urbanization and agriculture. Nutrient loading increased with the advent of phosphate detergents and inorganic fertilizers. Although controlled in most jurisdictions bordering the Great Lakes, phosphates in detergents continue to be a problem where they are not regulated.

Increased nutrients in the lakes stimulate the growth of green plants, including algae. The amount of plant growth increases rapidly in the same way that applying lawn fertilizers (nitrogen, phosphorus, and potassium) results in rapid, green growth. In the aquatic system, the plant life eventually dies, settles to the bottom, and decomposes. During decomposition, the organisms that break down the plants use up oxygen dissolved in the water near the bottom. With more growth, there is more material to be decomposed, and more consumption of oxygen. Under normal conditions, when nutrient loadings are low, dissolved oxygen levels are maintained by the diffusion of oxygen into water, by the mixing of currents and wave action, and by the oxygen production of photosynthesizing plants. (see figure 43)

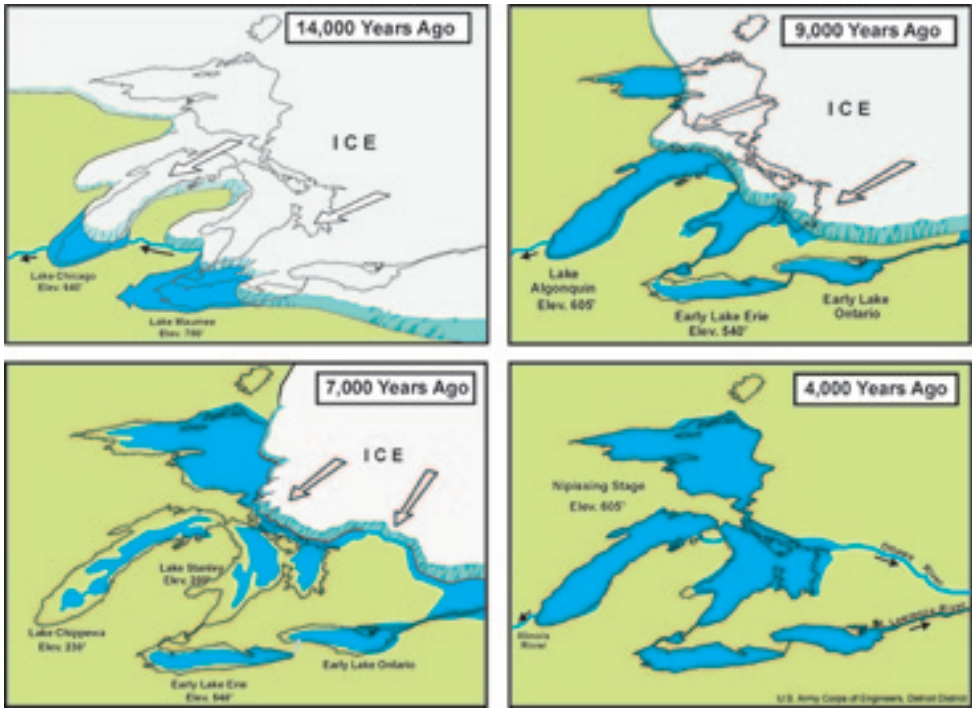

Figure 43

Natural Resource Issues and Concerns

A basin as large and as diverse as the Great Lakes Basin will have numerous natural resource concerns and challenges. This assessment will focus on three issues, all of which are impacted by agricultural production on private lands:

- Animal Waste/Nutrient Management
- Wetlands
- Biodiversity

Animal Waste/Nutrient Management

Animal waste and nutrient management are critical issues facing agricultural producers in the Great Lakes Basin. The potential for nitrates, from animal waste, impacting the Great Lakes has increased livestock producers' awareness for developing animal waste and nutrient management plans.

In 1997, there were an estimated 2.5 million animal units in the basin (within the Midwest Region). Estimates from NRCS and partners indicate that over 13,700 AFOs currently need a waste system or a nutrient management plan. This represents about 13 percent of the region's animal waste and nutrient management planning needs. In Fiscal Year 2000, NRCS and their partners assisted basin livestock producers to develop 453 animal waste system plans. (see figure 44). At the current rate, it will take more than 30 years for NRCS and partners to address the animal waste and nutrient management planning needs in the Great Lakes Basin.

Wetlands

Wetlands are a key category of habitat, within the basin, because of their importance to the aquatic plant and animal communities. Many natural wetlands have been filled in or drained for agriculture, urban uses, shoreline development, recreation, and resource extraction (peat mining). Losses have been particularly high in the southern portions of the basin. It is estimated, for example, that between 70 and 80 percent of the original wetlands of Southern Ontario have been lost since European settlement. In the U.S. portion of the basin, these losses range from 42 percent in Minnesota to 92 percent in Ohio. The loss of these lands poses special problems for hydrological processes and water quality because of the natural storage and cleansing functions of wetlands. Moreover, the loss makes it difficult to preserve and protect certain wildlife species that require wetlands for part or all of their life cycle.

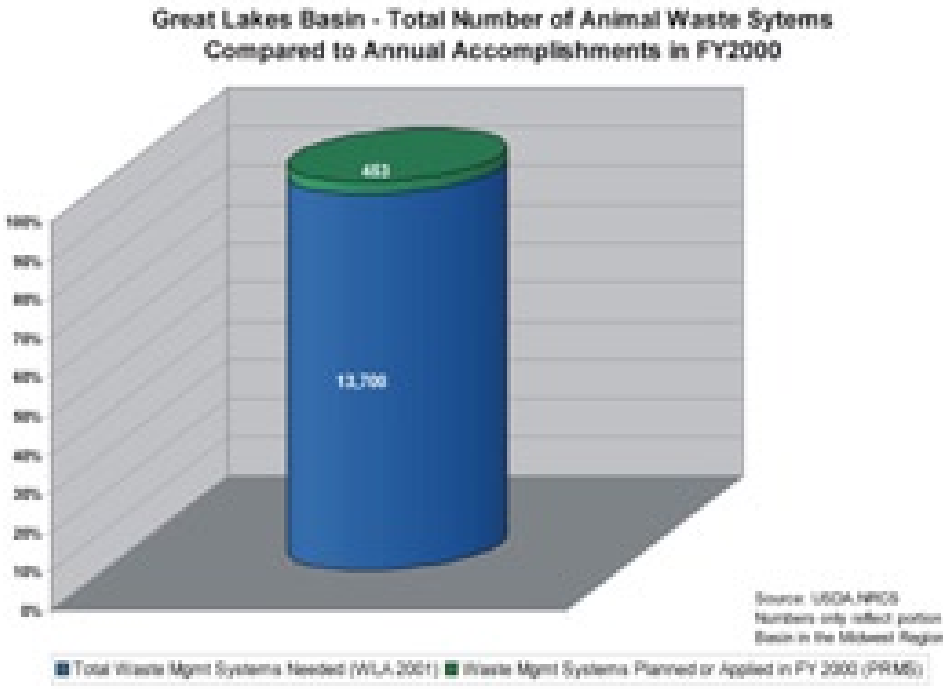

Figure 44

Biodiversity

Biodiversity refers to both the number of species and the genetic diversity within populations of each species. Some species have become extinct as a result of changes within the Great Lakes Basin and many others are being threatened with extinction or loss of important genetic diversity. Recovery of some highly visible species, such as eagles and cormorants, have been dramatic, but other less known species remain in danger.

The rapid, large-scale clearing of land for agriculture brought rapid changes to the ecosystem. Soils stripped of vegetation washed away to the lakes, tributaries, and silty deltas clogged and altered the flow of the rivers. Fish habitats and spawning areas were destroyed. Greater surface runoff led to increased seasonal fluctuations in water levels and the creation of more flood-prone lands along waterways.

Agricultural development has also contributed to Great Lakes pollution, chiefly in the form of eutrophication. Fertilizers that reach waterways in soils and runoff stimulate growth of algae and other water plants. The plants die and decay, depleting the oxygen in the water. Lack of oxygen leads to fish kills, and the character of the ecosystem changes as the original plants and animals give way to more pollution-tolerant species.

Conservation Successes

USDA programs, such as the Conservation Reserve Program and the Wetlands Reserve Program, have helped increase biodiversity by rehabilitating once farmed areas into wetlands, grasslands, and forests. Over 35,500 acres of wetlands have been restored in the Great Lakes Basin within the Midwest Region. Additionally, over 660,000 acres of fragile land in the basin has been protected through the utilization of CRP. (see figure 45)

The application of conservation buffer practices on private lands are aimed at controlling erosion and reducing runoff of soil, sediment, nutrients, and pesticides. As of October 1, 2000, approximately 22,300 acres of buffers have been established in the basin through the Continuos CRP and the CREP.

Figure 45

Summary of the Great Lakes Basin

The Great Lakes ecosystem greatly affects our way of life, as well as all aspects of the natural environment, from weather and climate, to wildlife and habitat. Yet, for all their size and power, the Great Lakes are fragile. In the past, this fragile nature was not recognized and the lakes were mistreated for economic gain. This placed the ecosystem under tremendous stress from human activities. Today, we understand that our health and our children's inheritance depend on our collective efforts to wisely manage our complex Great Lakes ecosystem.

Great Lakes Basin Facts

- The Great Lakes holds one-fifth of the world's fresh water supply.
- Spread across the contiguous 48 states, the lakes' water would be 9.5 feet deep.
- Outflow from the Great Lakes is less than one percent of the total water volume.
- In FY 2000, there were 453 animal waste systems planned in the Great Lakes Basin.
- Over 35,500 acres of wetlands have been restored through the implementation of the Wetlands Reserve Program in the Basin.
- Over 660,000 acres have been protected by their enrollment in the Conservation Reserve Program.
- The Great Lakes cover more than 94,000 square miles of total area.